

ARTICLE APPEARED
ON PAGE 1CHRISTIAN SCIENCE MONITOR
14 June 1985

Keeping track of the subs

Technology gives US vessels their stealthy edge

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Washington

The pumps they don't use are one of the most important features of United States Trident submarines.

To help them run as quietly as rustling leaves, these huge missile subs can use "natural circulation" nuclear reactors. Cooling water is sucked into the reactor, not by thumping pumps, but with currents created by engine heat.

Such technological tricks are what give the US an edge in the shadowy war beneath the seas. The US submarine fleet is still almost invulnerable, Navy officers claim — despite any secrets passed to the Soviets by the alleged Walker spy ring.

"There is no indication the Soviets have broken the code about how to detect our [missile] subs," says the Chief of Naval Operations, Adm. James D. Watkins.

US subs rely on sophistication because, as in most aspects of military power, they are outnumbered by the Soviets. The undersea fleet of the USSR consists of 357 combat vessels; the US had 134 operational subs at the beginning of this year, according to the International Institute for Strategic Studies.

The huge Trident, longest submarine in the world, is the newest class of US sub. Tridents carry 24 nuclear-tipped ballistic missiles aimed at the USSR, as well as torpedoes. Four Tridents are now on patrol, with two more in sea trials. The Navy plans to field 15 of these behemoths.

The sea leg of the US nuclear triad is rounded out by 31 smaller missile submarines of the Lafayette class, each of which carries 16 ballistic missiles.

The Navy also has four subs outfitted with cruise missiles and a grab bag of 95 attack subs. The attack subs, in wartime, would protect US ships and chase Soviet surface ships and subs; to upgrade this force the Pentagon is now designing a futuristic fast-attack boat, the SSN-21, for deployment in the 1990s.

The US undeniably has fewer subs than the USSR. But in undersea warfare numbers are not the only things that count.

The size gap "is bad, but I think we tend to overplay the numbers too often," admitted Adm. Kinnaird R. McKee, director of the Navy's nuclear propulsion program, in a closed congressional hearing on March 21.

For one thing, the US Navy plans to use attack subs as lone wolves, sent out to tie up concentrations of enemy forces. If a US sub "isn't outnumbered, he has gone to the wrong place," said Admiral McKee.

And while the newest Soviet subs are faster, and dive deeper, than US counterparts, US subs are far more quiet. To US naval officers, stealth is the most important virtue a submarine can have.

US sub turbines are mounted on rubber shock absorbers. Some pumps, such as those on the Trident reactor, have been augmented by "natural circulation," which requires advanced alloys able to stand sudden temperature extremes.

On patrol, US subs even avoid predictable patterns. They make random turns literally dictated by throwing dice, or a random-number generator.

How safe does this make them from Soviet detection, especially in light of the fact that the USSR may now be privy to some sub communication secrets?

Admiral Watkins claimed that the US Navy spends "much effort" on trying to determine if sub patrols are detected, and that as far as the Navy knows, the Soviets can't do it effectively.

A government source with experience in antisub warfare claims privately that even US sonar planes, far more advanced than their Soviet equivalent, find it "impossible" to locate US subs.

In general, antisubmarine warfare is a difficult, sometimes baffling business. It emphasizes electronics and delicate sensors, things the US builds better than the USSR. But the vagaries of the deep still have a way of confounding the most expensive computer.

"I've always said sub tracking is more art than science," says an Navy antisub officer now serving a Pentagon tour of duty.

The mainstay of US antisub defense is the venerable P-3, a turboprop plane jammed with more electronics than a small computer trade show.

Navy P-3s patrol the oceans from bases all over the world. They drop patterns of sonobuoy listening posts in the sea and strain to hear the mechanical rhythms that give a sub away. When they think they've pinpointed a sub, they dive down low to try for a positive reading with the magnetic-field detectors sticking out of their tails. In wartime, they would drop depth charges or torpedoes at an identified enemy.

The Navy also uses antisub, sonar-equipped ships and helicopters and has an officially secret string of listening posts on the seabed at such key choke points as the Greenland-Iceland-United Kingdom gap. Navy P-3 pilots pride themselves on being able to detect not only that a submarine is around but which particular submarine it is. Oscilloscope patterns can show a pattern from a distinctively unbalanced propeller, for instance.

But ocean conditions can play havoc with readings. Water layers of differing temperatures can distort sound waves, making a submarine 100 miles away sound nearby.

Typhoon-class subs are apparently equipped to operate through soft spots in the Arctic ice. If they do be-

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come floating bastions operating north of the Arctic Circle, the US can find them only by sending other subs after them.

The Navy is thus rediscovering something it pioneered — under-ice operations. Two US subs, the Gurnard and the Pintado, operated under the polar icecap for seven weeks last year, according to recently released congressional documents.

The chancy game of sub tracking may be aided in the future by nonacoustic methods, add experts, such as blue-green lasers, and satellite detection of the minute surface ripples caused by passing submarines.